Armed Forces College of Medicine

AFCM

Male Genital System II

(Interstitial cells and genital gucts)

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INTENDED LEARNING OBJECTIVES (ILO)

By the end of this lecture the student will be able to:

1- Describe the microscopic structure (LM & EM) of Leydig cells.

2- Correlate the microscopic structure of Leydig cells to their function.

3- Describe the microscopic structure of intratesticular and extratesticular (epididymis, vas deferens) duct system

4- Correlate the microscopic structure of the epididymis and vas deferens to their function.

5- Interpret the microscopic changes in epididymis and vas deferens in different diseases

Lecture Plan

1. Part 1 (5 min)
2. Part 2 (35 min)
3. Part 3 (5 min)
4. Lecture Quiz (5 min)

Sperm production (Spermatogenesis)

rm production (spermatogenesis) includes:

1. **Spermatocytogenesis: Formation of spermatids from spermatogonia**

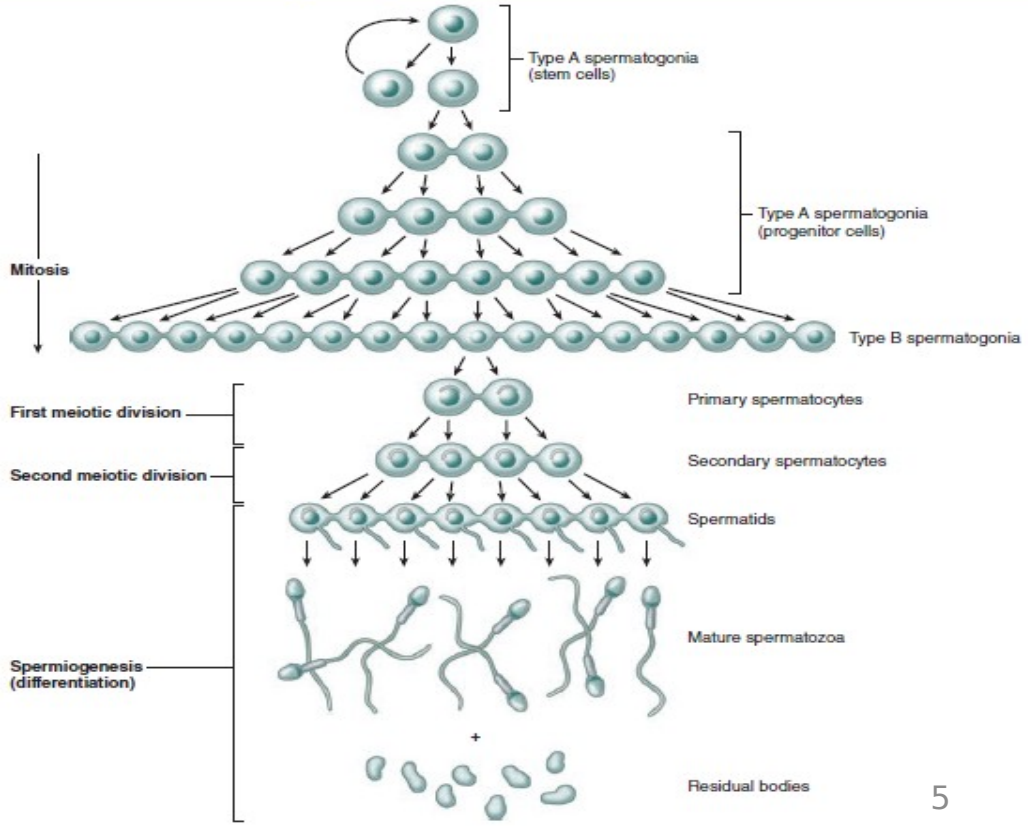
Including ***mitosis*** of spermatogonia and ***meiosis*** (1ry&2ry meiotic divisions)

2. **Spermiogenesis: Spermatids diff**

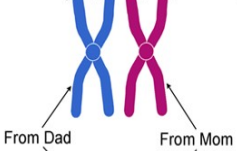
sperm

Spermatogenesis

- Begins at puberty
- Under control of FSH
- Lasts about 2 months



46 chromosomes in the form of **23 pa**



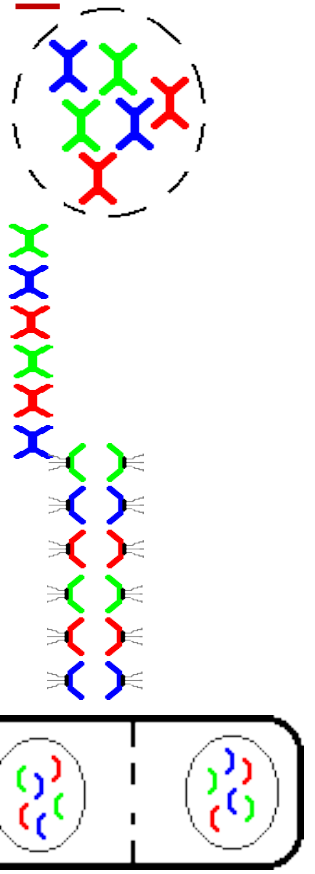
Mitosis

Prophase

Metaphase

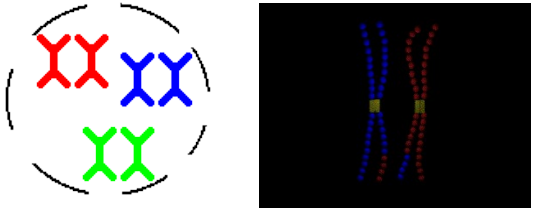
Anaphase

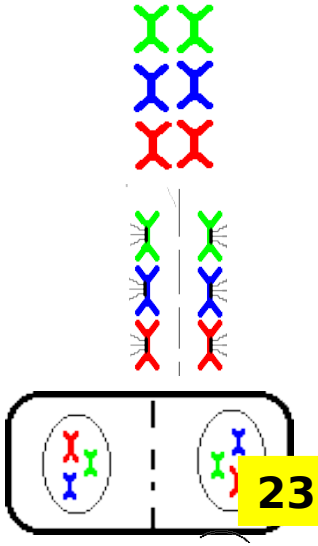
Telophase



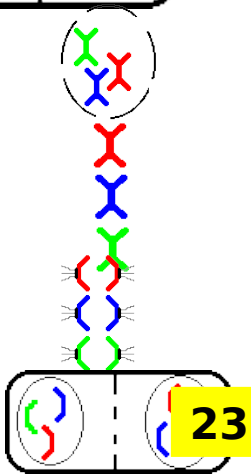
46 s-chromosome

Meiosis





23 d-chromosomes



23 s-chromosomes

MiTosis: each daughter cell ends up with Two complete sets of chromosomes

Meiosis

Meiosis includes 2 successive cell divisions: 1st & 2nd meiotic division

(46 d-chromosomes**)**

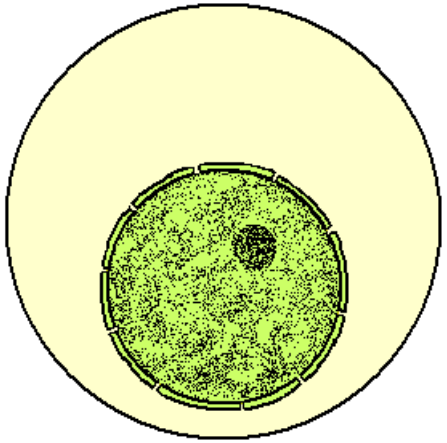
First meiotic division

Secondary spermatocytes

23 d-chromosomes

Secondary spermatocytes

23 d-chromosomes



Second meiotic division

Spermatid

23 s-chromosomes

Spermatid

23 s-chromosomes

Spermatid

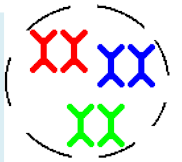
23 s-chromosomes

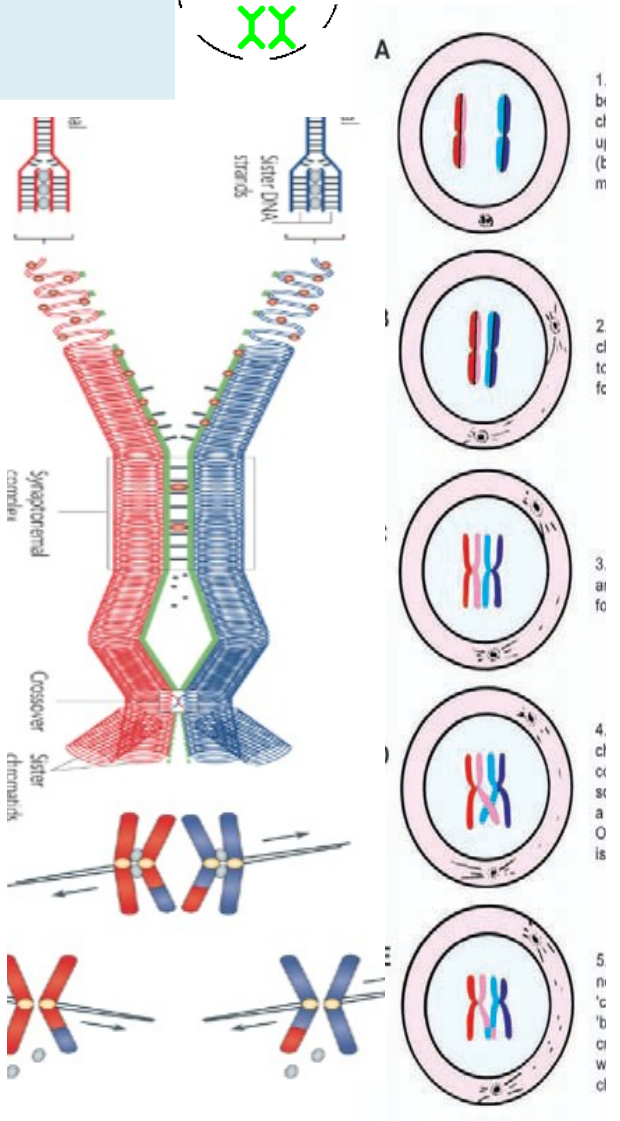
Spermatid

23 s-chromosomes

Meiosis

S phase---each chromosome is of 2 sister chromatids--46d-chromosomes





- **First meiotic division:**

1. Prophase I:

- **Prolonged** (22 days).
- Chromosomes become **thicker & shorter**.
- The 2 chromosomes of each pair (23 pairs) come together & form **synapsis** with formation of **synaptonemal complexes** between the 2 chromosomes where DNA----DNA exchanges **(Crossing Over)** between the maternal and paternal chromosomes

Meiosis

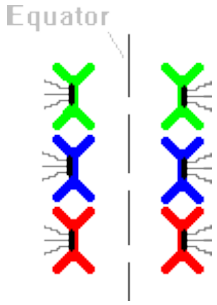
2. Metaphase I:

The 46 d-chromosomes become attached to the spindle **at the equator in pairs**.

3. Anaphase I:

-**No splitting** of the chromosomes

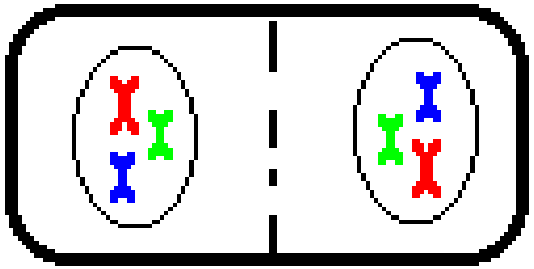
-**One entire chromosome** of each pair move to each pole of the spindle



4. Telophase I

-Cleavage occurs

-The resulting daughter cells have **23 d**-chromosomes (each chromosome is formed of 2 chromatids).



Meiosis

➢ Second meiotic division

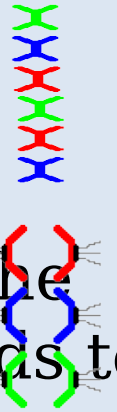
***Not preceded by S phase*. It is**

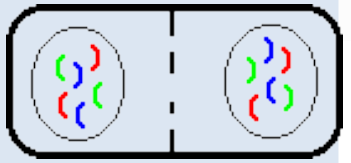
❑ ***Metaphase II:***

Chromosomes lie up the equator, the kinetochore attach to the spindle.

❑ ***Anaphase II:***

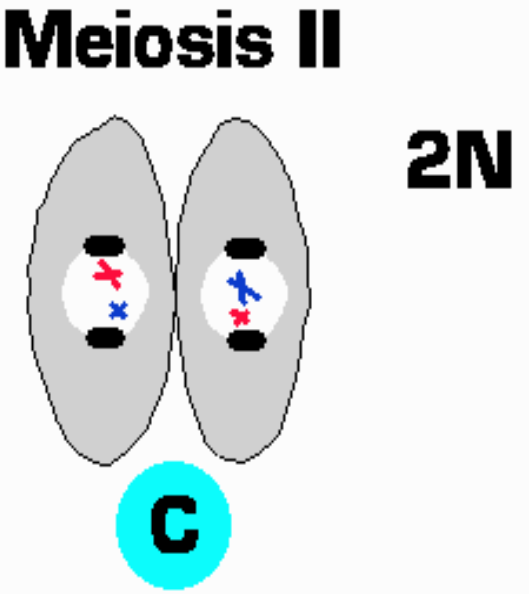
2 chromatids of each chromosome ***split*** at the centromere followed by migration of chromatids to opposite poles.





❑ ***Telophase II:***

Results in **2 cells;** each containing **23s** chromosomes.

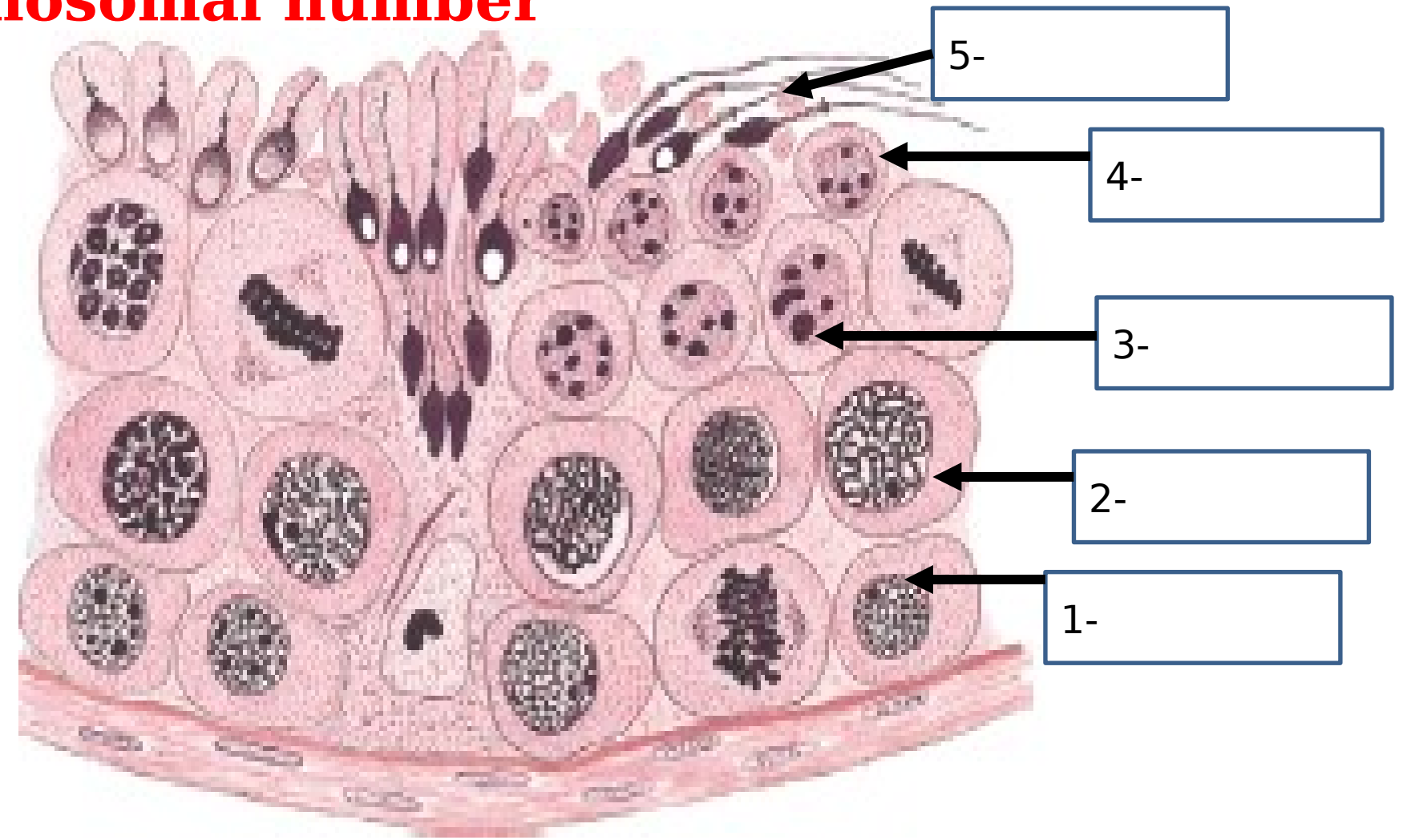


ch contains

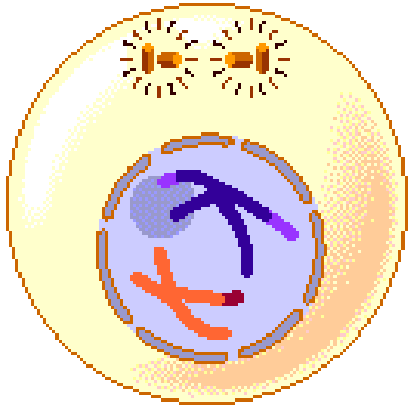
23 s-chromosomes.

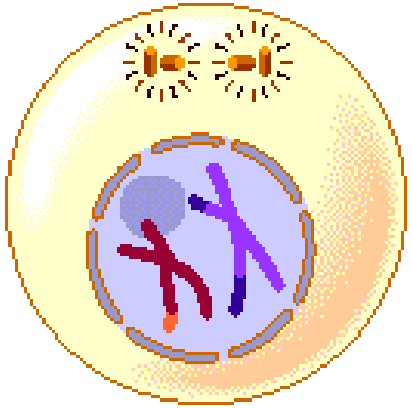
Quiz

Label the cells with mentioning their chromosomal number



Quiz



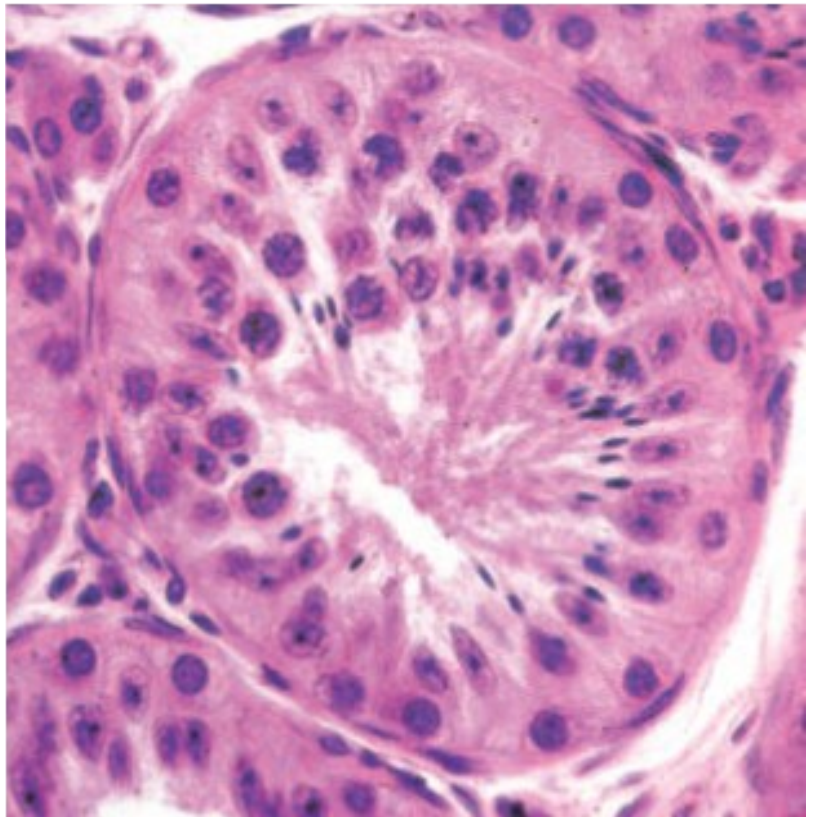


Which division?

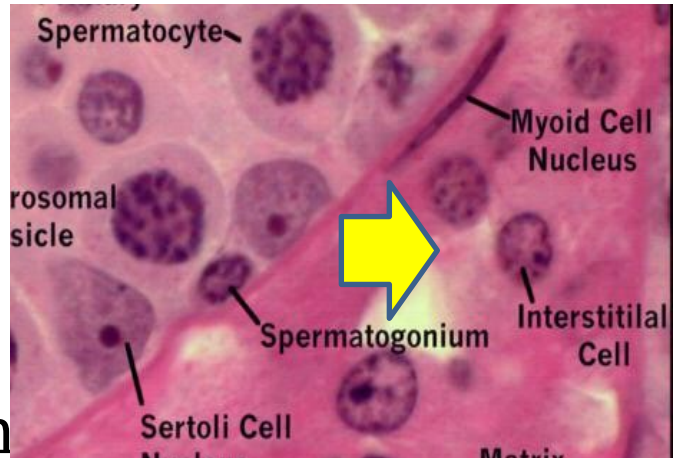
Interstitial tissue of the testis

The spaces between the seminiferous tubules within a lobule contain sparse C.T. containing:

- **Fenestrated capillaries**, lymphatics, nerves, fibroblasts, mast cells, macrophages,
- **Interstitial cells of Leydig**.

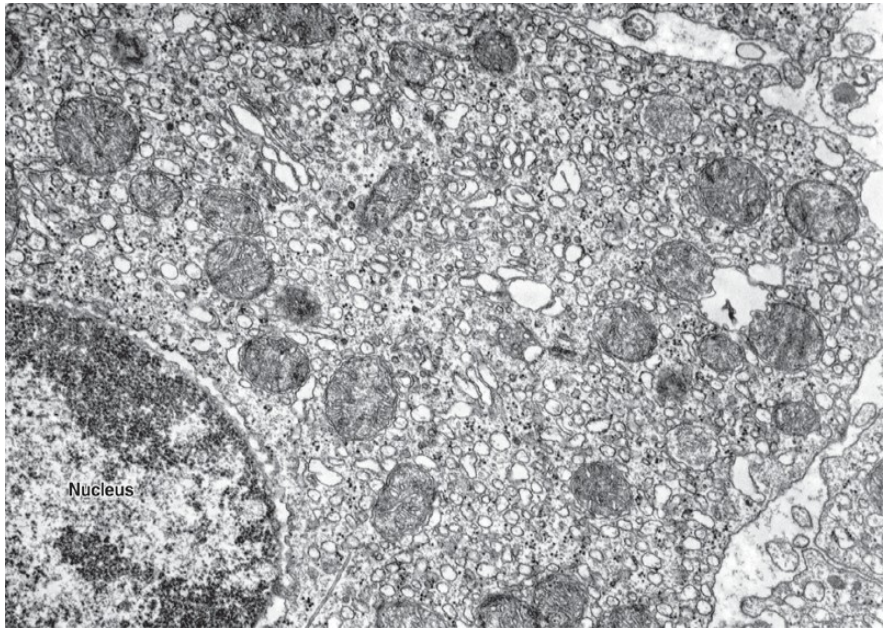


Interstitial cells of Leydig



- **Site:** between seminiferous tubules
- **LM:**
- **Shape:** rounded polyhydral, present singly or in groups
- **Cytoplasm pale acidophilic vacuolated** rich in lipid droplets.
- **EM:**
- **Nucleus** single central rounded **vesicular**
- Abundant **smooth ER**
- **Mitochondria** with tubular
- **Golgi** apparatus
- Numerous **lipid** droplets

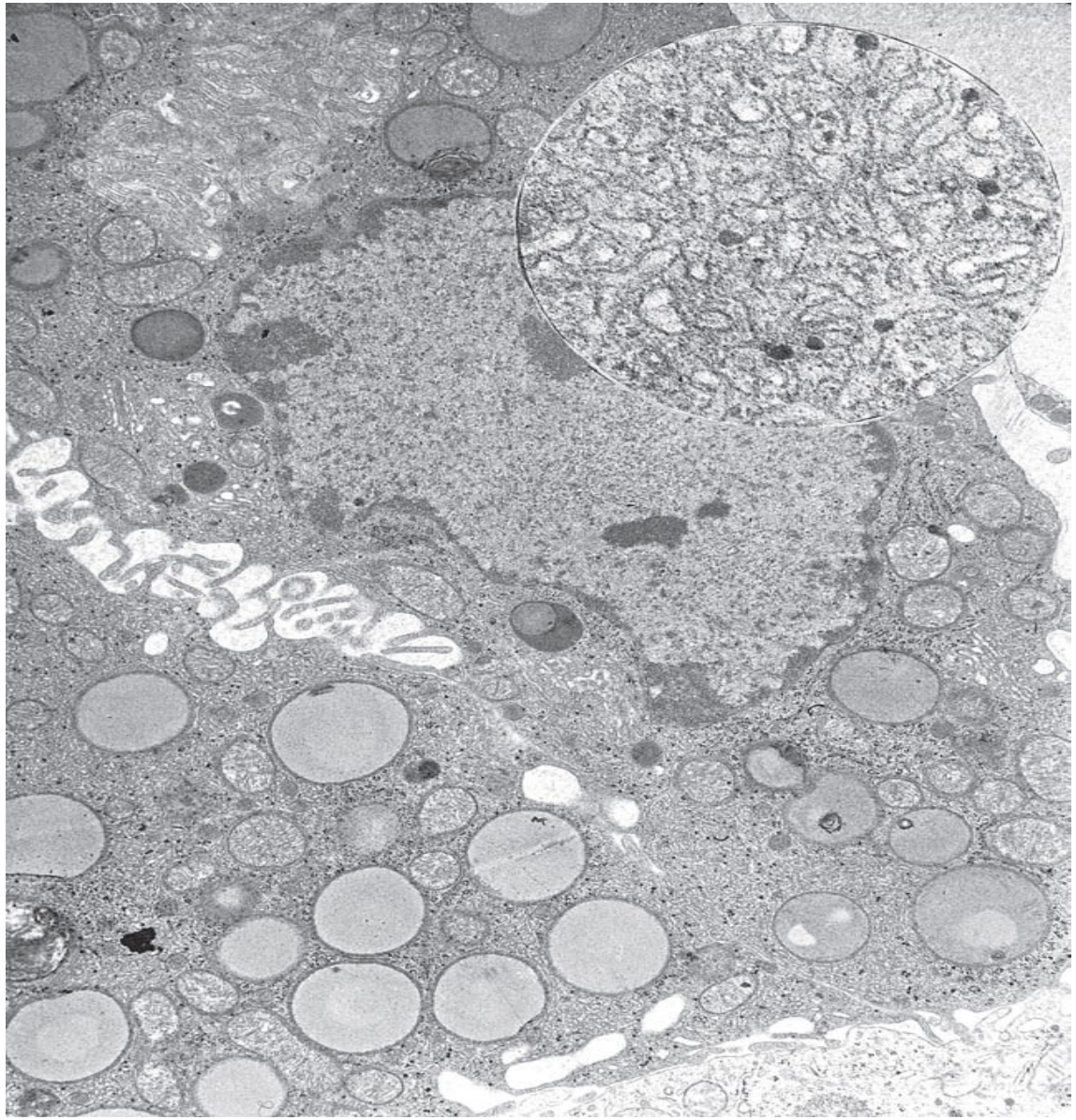
characters of steroid producing cells.



Lysosomes, peroxisomes, some rER
Lipofuscin pigments especially in older men

No secretory granules because the cells secrete without storage of their production

Interstitial cells of Leydig



Crystals of Reinke are inclusions formed of crystalloid protein and they are a **characteristic of the interstitial cells of Leydig**.

- **Functions:**

Secretion of **testosterone under control of LH** from Gonadotrophs.

Testosterone is important for spermatogenesis, male sex characters.

Male reproductive system

1- **Testis** (sperms & testosterone)

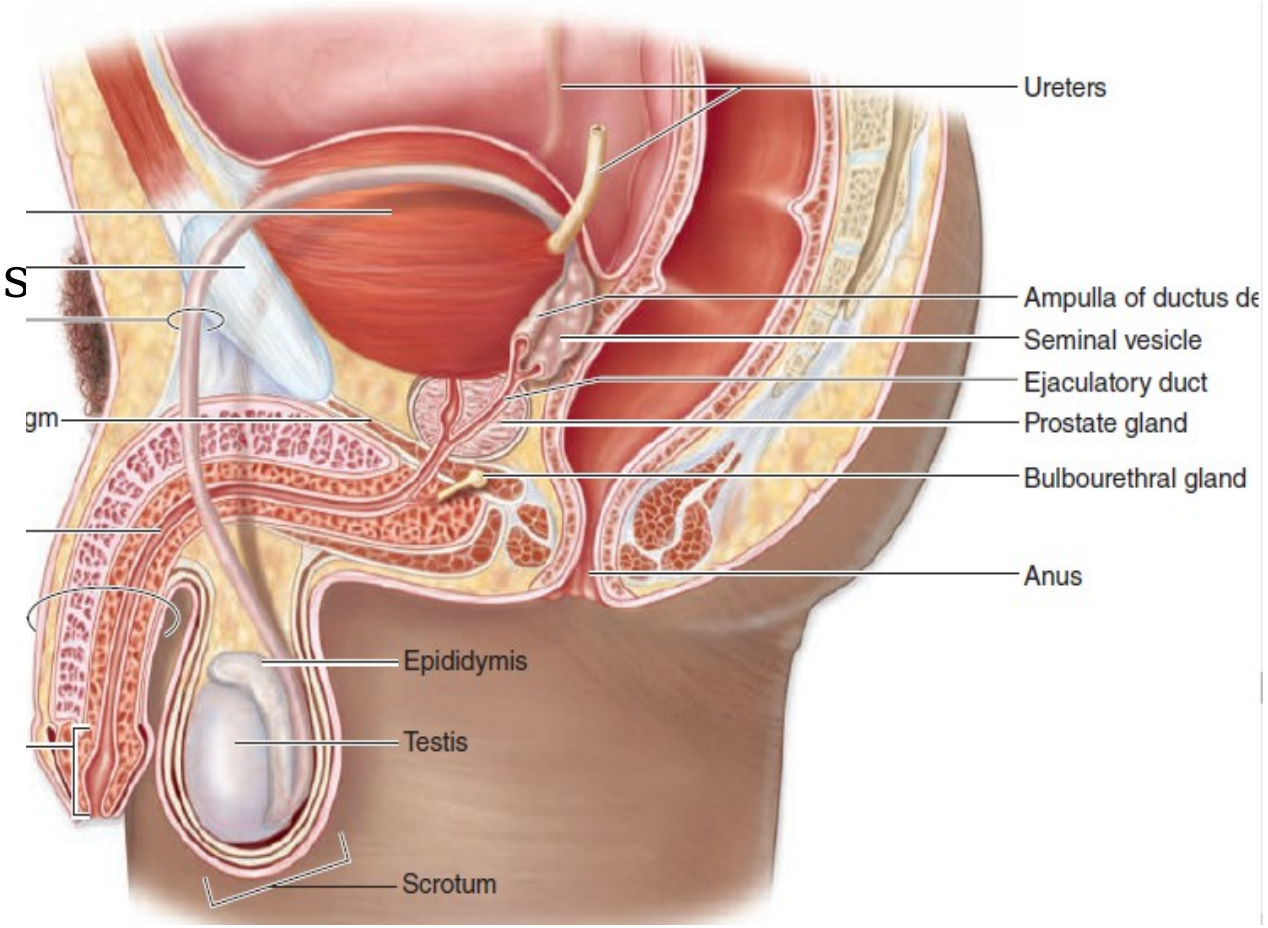
2- **Duct System**:

1-straight tubules
2-Rete testis
3-Efferent ductules
4- Epididymis
5- Vas deferens

3- Accessory organs

1- Prostate
2- Seminal vesicles
3- Bulborethral gland

4- **Penis**



Ducts of the male reproductive system

Intratesticular

1- **Straight tubules** (tubuli recti)

↓

2- **Rete testes**

↓

3-Efferent ductules (ductuli efferents)

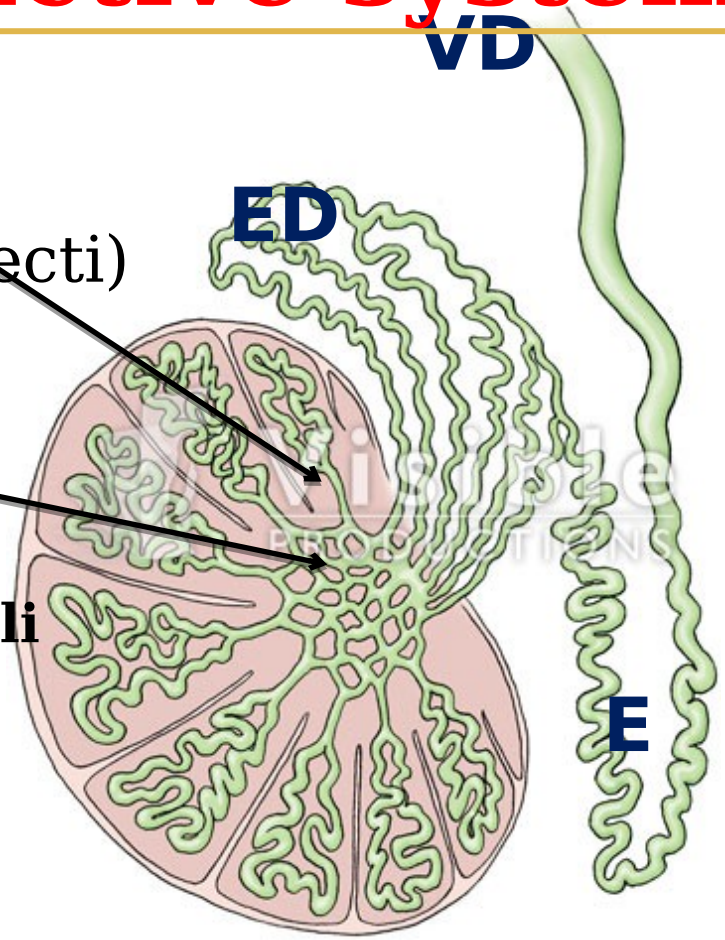
↓

Extratesticular

4- Epididymis

↓

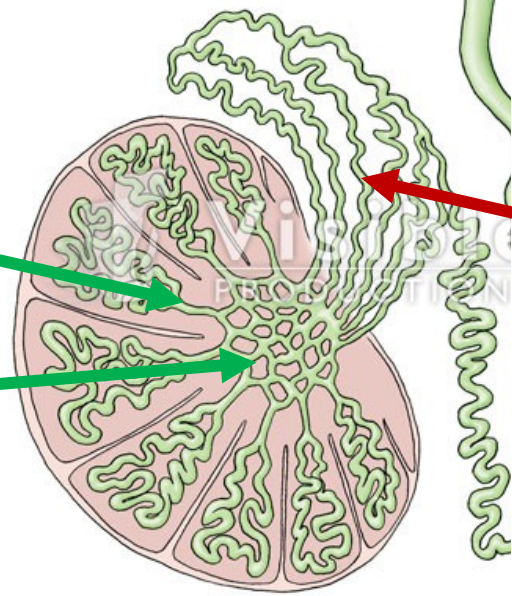
5- Vas (ductus) deferens



Ducts of the male reproductive system

- **Straight tubules: (Tubuli recti)**

  Lined with **Sertoli cells**



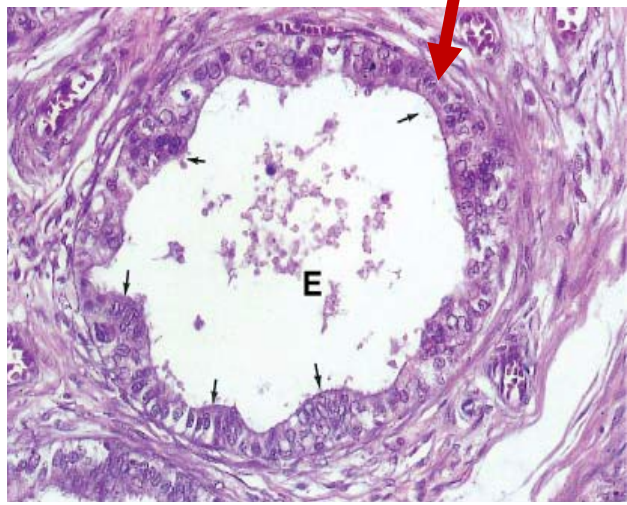
2- Rete testis:

Interconnected network of channels

lined by

simple cuboidal cells.

3- Efferent ductules: (Ductuli efferentes)



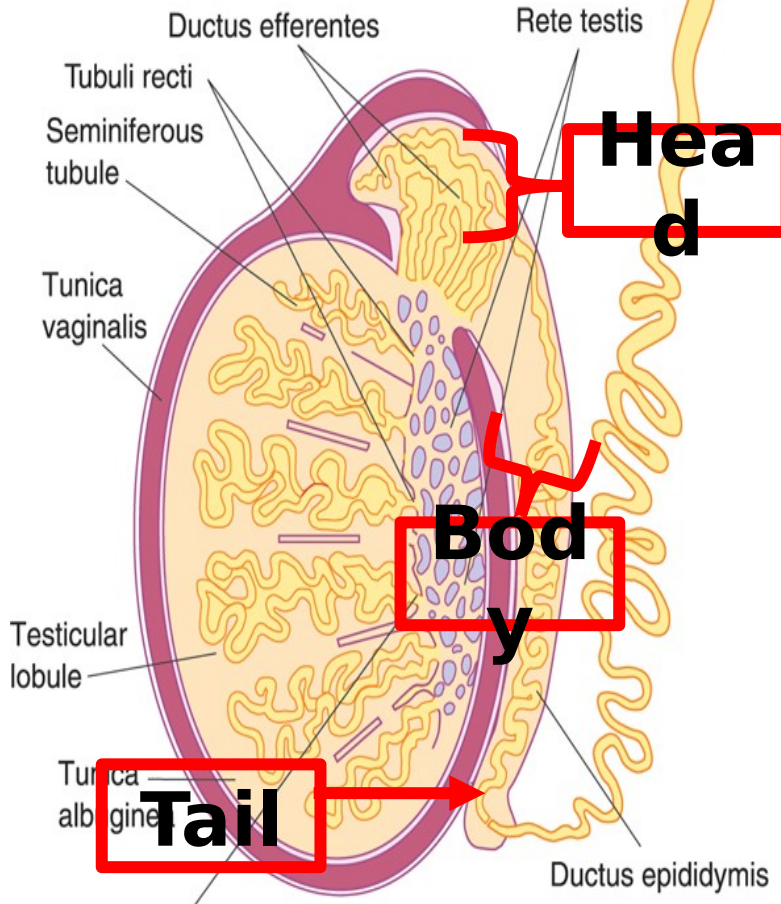
- About 20
- Lined with groups of ***non-ciliated cuboidal cells***

  (Absorb most of fluid secreted by Sertoli cells)
- Alternate with groups of ***taller ciliated columnar cells***

Ducts of the male reproductive system; Epididymis

4- Epididymis

a. **Head:** entrance of efferent ductules.
b. **Body:** highly coiled single tube
c. **Tail**



➢ LM:

- **Wide lumen** and **thin wall**.
- **Lining ep.: Pseudostratified columnar epithelium**

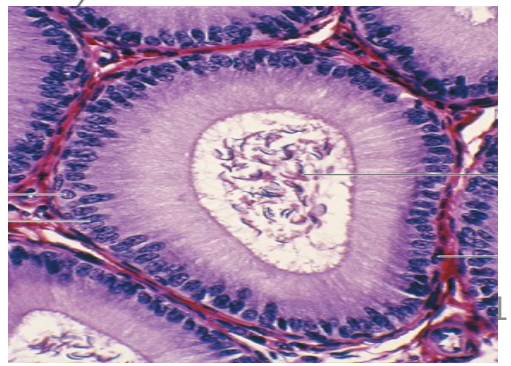
o **Principal cells**: tall columnar cells have **non-motile sterocilia.**
o **Basal cells:** as stem cells

➢ EM:

- RER, lysosomes, prominent Golgi complex.

Lamina propria

Circularly arranged **smooth muscle** fibers that



Ducts of the male reproductive system;

Epididymis

- **Functions of epididymis:**

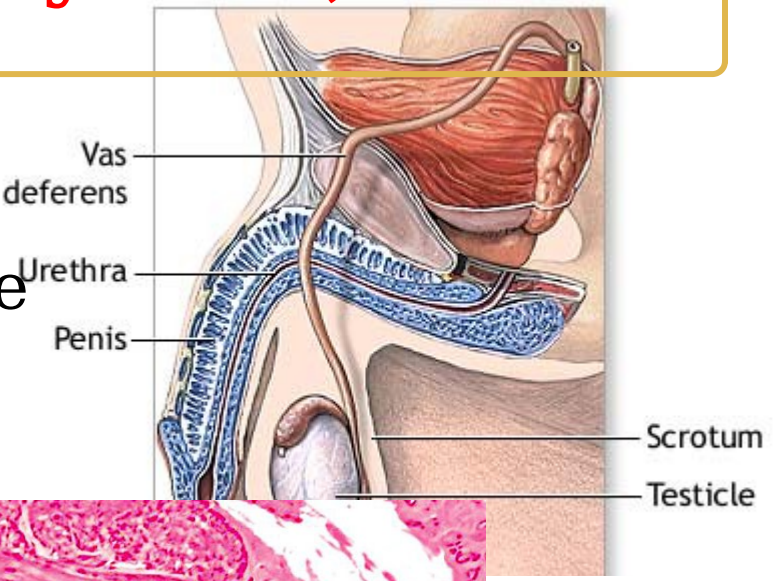
1. **Absorption of water, excess fluid** (about 90% of the testicular fluid).
2. **Remove residual bodies.**
3. **Secretion of proteins, glycoproteins, exosomes.**

(Role in maturation and motility of the spermatozoa)

Changes in spermatozoa while passing through the epididymis include:

1. **Development of competence for forward motility.**
2. **Reorganization of the cell membrane surrounding sperm head, by addition "decapacitation factors", which block the acrosomal reaction, a key event in fertilization.**

Ducts of the male reproductive system; Vas deferens



5. Vas deferens (ductus deferens)

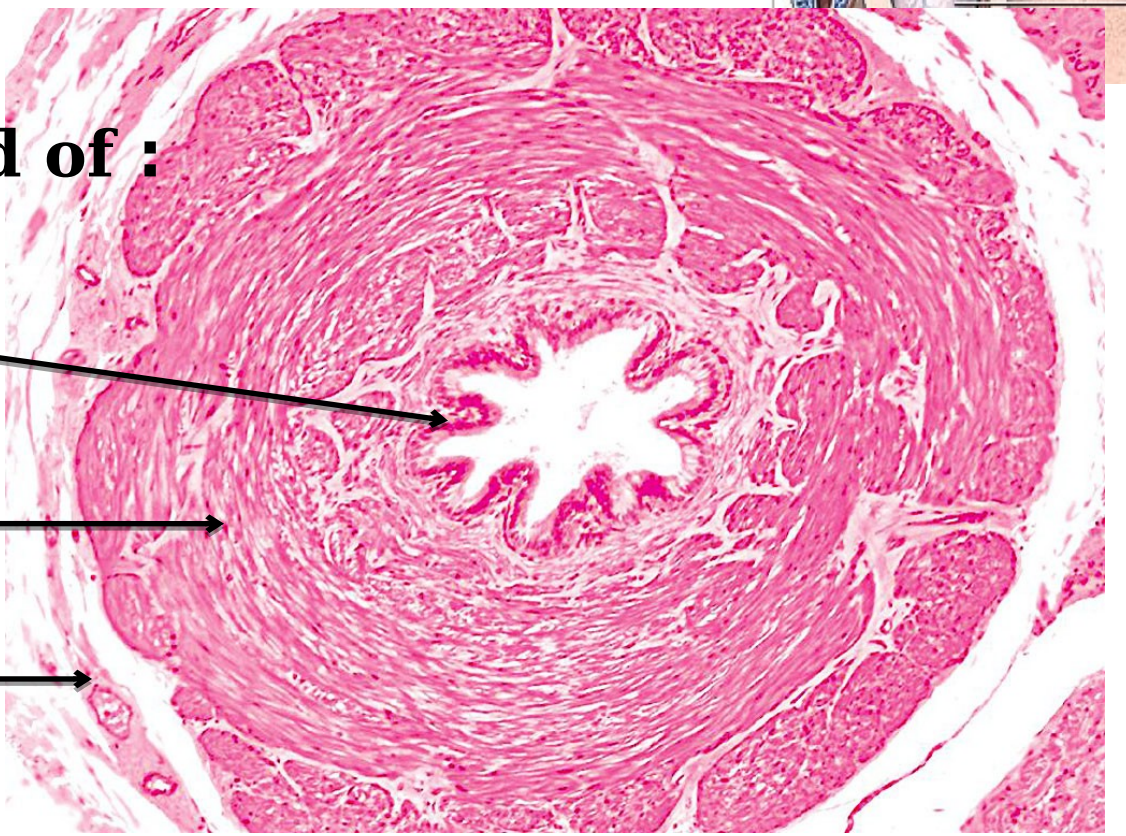
- **Site:** It extends from the tail of epididymis to the prostatic part of urethra.
- **Shape:** a narrow irregular lumen, a **thick muscular wall**

Wall of vas deferens is formed of :

1- Mucosa

2- Muscle layer

3- Adventitia



Ducts of the male reproductive system; Vas deferens

1. **Mucosa:**

a) **Epithelium:** pseudostratified columnar epithelium with few stereocilia.

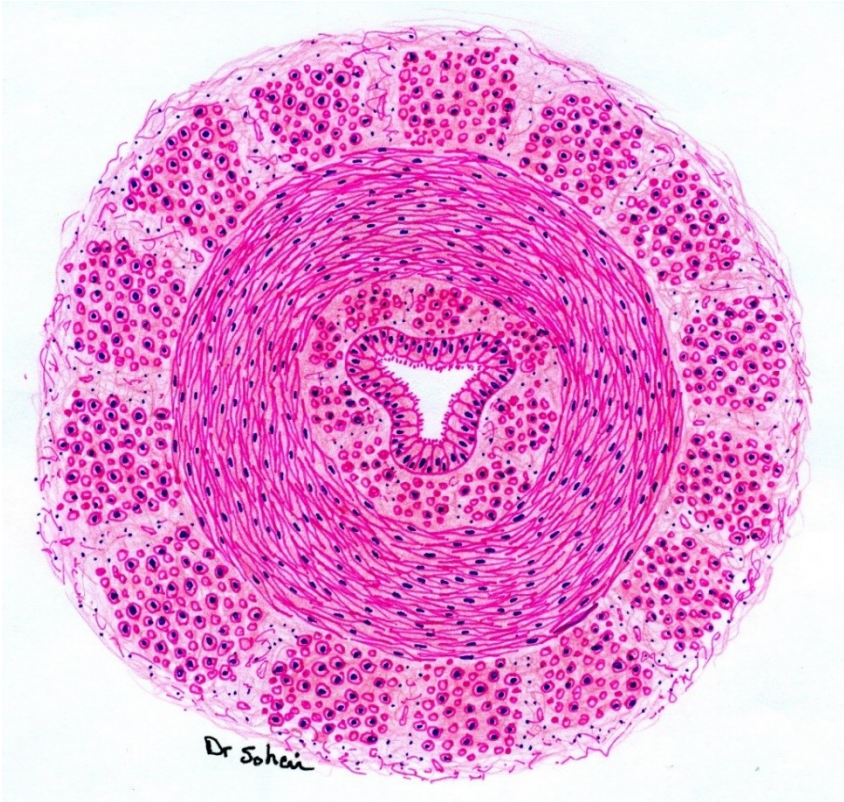
b) **Lamina propria** of loose C.T. rich in elastic fibers.

2. **Musculosa:**

very thick layer of smooth muscle fibers arranged as:

a. Inner longitudinal.
b. Middle circular.
c. Outer longitudinal.

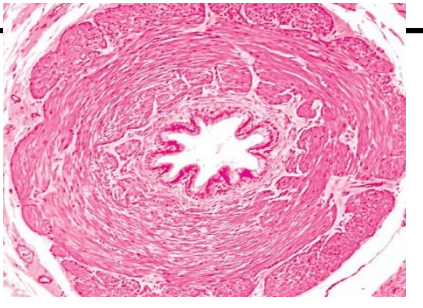
3. **Adventitia:** formed of loose C.T.



Function:

Pushes sperms to urethra during ejaculation by **contraction of the muscle** in its wall.

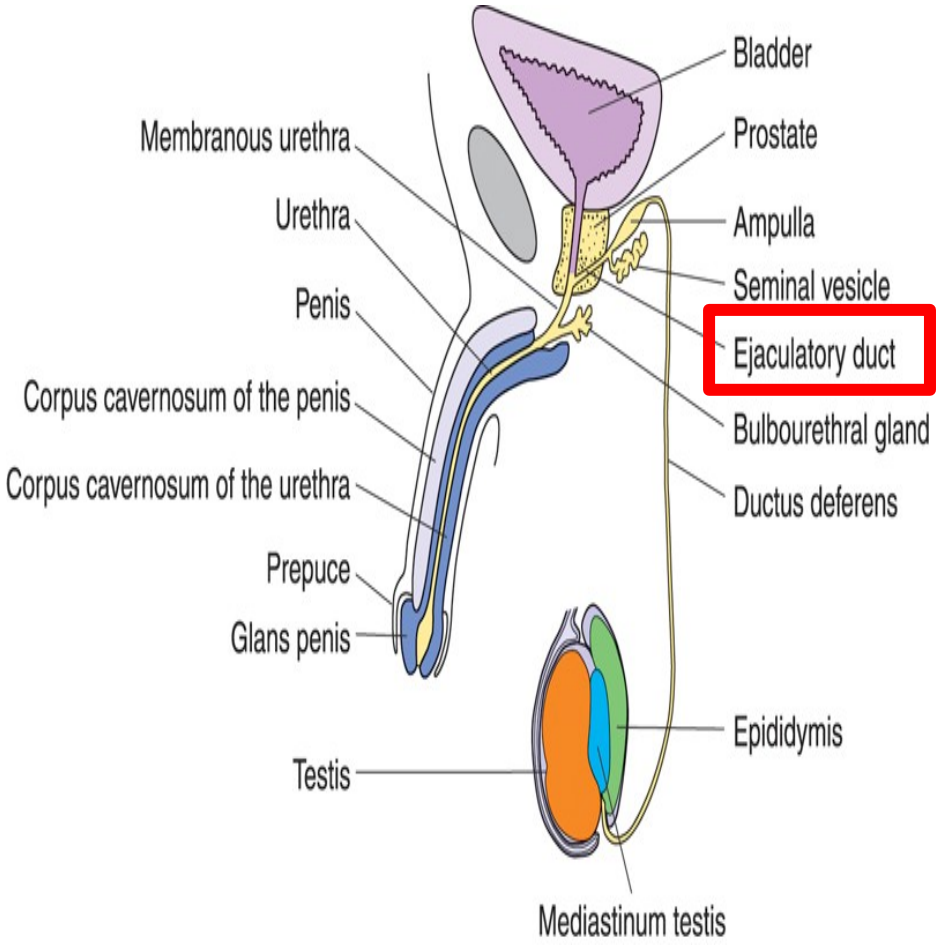
	Vas Deferens	Ureter
Length	45 cm	Longer
Diameter	3 mm	Wider
Lumen	Very narrow, folded	Wider, more folded
Mucosa	➢**Pseudo-stratified columar** with **stereolicia** ➢Narrow layer of loose C.T. contain b.v., nerves, lymphatics, elastic fibers	➢**Transitional** epithelium ➢Wide layer of loose C.T. contain b.v., nerves, lymphatic
Musculosa	**Thicker**, well developed	Thinner, less developed
	Both contain inner long., thick middle circular & outer long. layers of sm. m. (upper 2/3 of ureter, inner long. & outer circular.)	
Covering	By spermatic fascia containing bl.v.	Partially covered with peritoneum



Ducts of the male reproductive system; Ejaculatory duc

6. Ejaculatory duct

- Each ejaculatory duct is formed by union of ampulla of vas deferens with duct of seminal vesicle.
- It empties into prostatic urethra.
- It is lined with **simple columnar epithelium** surrounded by C.T.
- There is no muscle in wall.



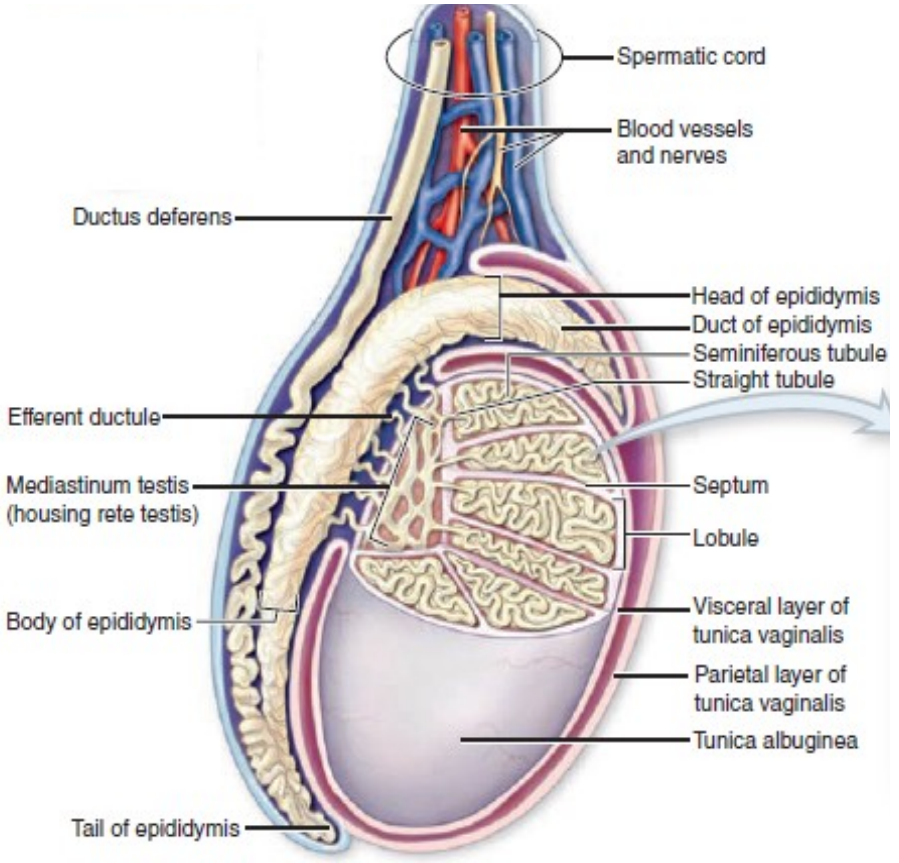
Spermatic cord

- **Formed by:**

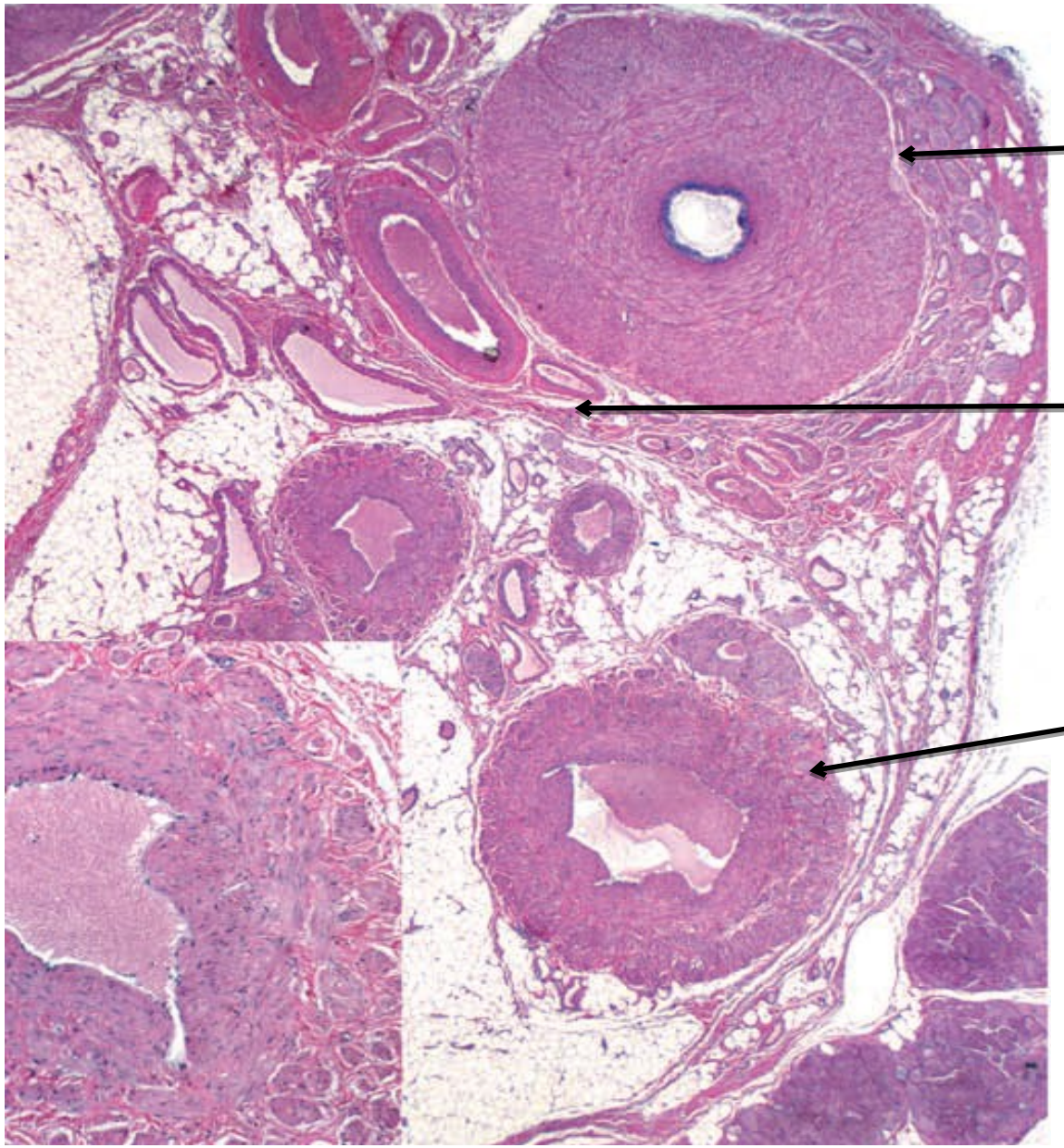
1. **Vas deferens**.
2. **Pampiniform plexus of veins that wind around vas**.

(Allows heat exchange between the blood vessels and helps maintain the testes at a lower temperature)

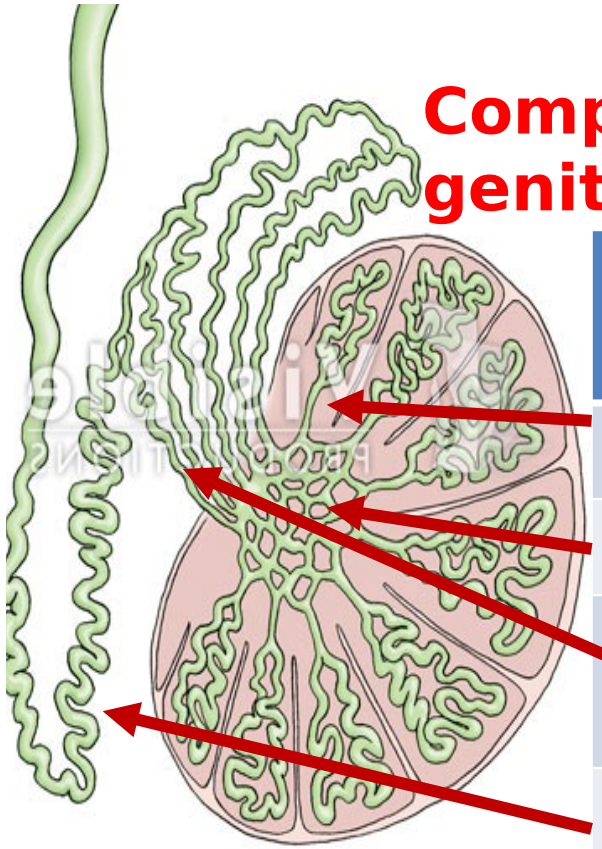
3. **Testicular artery & vein.**
4. **Nerve fibers**.
5. **Cremasteric muscle. Involuntary striated**



Spermatic cord



Lecture Quiz



Compare between the different parts of male genital duct system.

	Epithelium	Surrounding muscle	Function
Tubuli recti			
Rete testis			
Efferent ductules			
Epididymis			
Vas deferens			
Ejaculatory duct			

Lecture Quiz

Deduce the effect of epididymitis on male fertility.

Acute **epididymitis** is a result of **sexually transmitted infections** such as gonorrhea --------intrascrotal pain and tenderness. Persistent inflammation of the epididymis, such as that associated with **gonorrhea** infections, includes massive invasion by leukocytes, stimulating fibrosis that obstructs the epididymis and is a common cause of **male infertility**.

SUGGESTED TEXTBOOKS

1. **Mescher A (2021): Junqueira's Basic Histology, Text and Atlas. 16th Edition. Lange medical books/Mc Graw-Hill.**
2. **Michael H. Ross and WojciechPawlina (2016): Histology A Text and Atlas:, 7th edition.**


THANK
YOU